The Northwestern MILLER
MILLING PRODUCTION SECTION

Studies in the Removal of Extraneous Material in Milling Wheat

By Prof. John M. MacKenzie

Flour Milling Engineering Division
University of Minnesota

THE study reported here was undertaken to obtain an indication of the relative efficiency of combinations of various operations with the Entoleter scourer-aspirator, the Entoleter pre-break machine and the Kice aspirator that would produce the greatest reduction in fragment count in flour milled from the different wheat samples processed.

The wheat used in the tests was a highly infested lot of hard red winter wheat of southwestern origin. The lot of 10 bu. was cleaned in a Minneapolis mill and delivered to the flour mill engineering laboratory at the University of Minnesota, ready for tempering.

Four basic sequences of operations were agreed upon between George B. Wagner and R. C. Bradford of Pillsbury Mills, Inc., Arthur N. Hibbs, at that time research engineer for the Entoleter Division of the Safety Car Heating & Lighting Co., Inc., and the writer. Four sample lots of wheat for subsequent treatment were drawn from the original 10-bu. lot and assigned to the sequences, as follows:

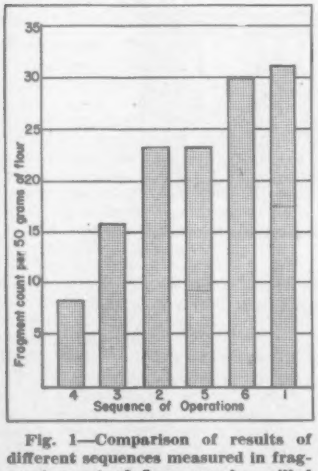

Fig. 1—Comparison of results of different sequences measured in fragment count of flour samples milled from treated wheat.

1. Temper, then passed through an Entoleter pre-break machine equipped with a 12½ in. blade rotor and corrugated liner, then passed through a Kice aspirator.

2. Temper, then passed through an Entoleter scourer-aspirator at 3,500 r.p.m., equipped with a 14 in. peg rotor, then through an Entoleter scourer-aspirator at 3,500 r.p.m., equipped with a 12 in. peg rotor, then through a Kice aspirator.

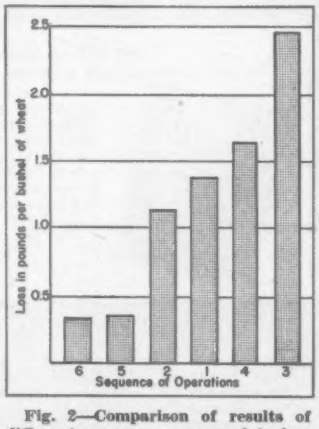

Fig. 2—Comparison of results of different sequences measured in loss of wheat to offals.

3. Temper, then through an Entoleter scourer-aspirator at 3,500 r.p.m. with a 14 in. peg rotor, then through an Entoleter pre-break machine equipped with a 12½ in. blade rotor and a corrugated liner, then through a Kice aspirator.

4. Passed through an Entoleter scourer-aspirator at 1,750 r.p.m. equipped with a 14 in. peg rotor, then temper, then through an Entoleter scourer-aspirator at 3,500 r.p.m., equipped with a 14 in. peg rotor, then through an Entoleter pre-break machine with a 12½ in. blade rotor and corrugated liner, then through the Kice aspirator.

5. Temper, then through an Entoleter scourer-aspirator at 3,500 r.p.m. with a 14 in. peg rotor, then through a Kice aspirator.

6. Temper, then through an Entoleter scourer-aspirator at 3,500 r.p.m. equipped with a 14 in. peg rotor, then through an Entoleter scourer-aspirator equipped with a disc rotor. (The disc was obtained by inverting the 14-in. peg rotor.)

Samples for subsequent milling on a Buhler experimental mill were taken of the untreated wheat as well as of all samples used in the different sequences. In addition, samples of the wheat were taken after each step in each sequence. The wheats and the flours milled were subjected to examination for infestation and fragment analysis, respectively. Additional samples for fragment analysis only were taken from the offals.

The offals were taken from the cyclone dust collectors after all operations and from the expansion or settling chamber on all Entoleter scourer-aspirator operations. A weight record of all samples and offals was maintained and the summary of this data appears in Table 1.

The controllable variables in each operation were (1) the rate of feed, and (2) the air flow. The values of these two variables do not necessarily represent the optimum, but are those which could be duplicated under the conditions of the test. The rate of feed and air volume for each operation in each sequence are shown in Table 2.

Table 1—Offal and Sample Weights

Sequence No.	Weight to operation	Weight of offals: Expansion chamber	Weight of offals: Cyclone	Weight milling sample
	(lb.)	(lb.)	(lb.)	(lb.)
1	300.0	3.5	1.75	11.00
	283.8	...	1.63	8.00
2	300.0	0.09	1.75	11.00
	287.2	0.70	2.50	9.00
	275.0	...	.38	10.75
3	300.0	0.20	1.40	10.00
	288.4	4.75	2.0	9.38
	272.3	...	3.38	8.88
4	300.0	0.01	0.35	12.75
	300.0	0.17	1.25	11.50
	287.1	3.25	0.30	10.00
	273.5	...	2.25	10.00
5	300.0	0.25	1.20	9.25
	165.0	...	.09	12.00
6	300.0	0.25	1.20	9.25
	145.0	...	.08	9.50

Table 2—Test Conditions—Feed and Air Flow

Sequence	Rate of feed bu./hr.	Air flow: Static pressure inches H_2O	Air flow: CFM
1	172	0.50	
	28		600
2	200	1.50	
	346	1.50	
	28		600
3	300	1.50	
	177	0.50	
	27		600
4	300	1.75	
	327	1.50	
	192	0.75	
	33		625
5	360	1.50	
			600
6	360	1.50	
	150	.50	

The test runs were made under the supervision of R. C. Bradford by the writer. Milling of the different samples on a Buhler experimental mill was carried out in the research laboratory of a Minneapolis mill and the fragment analysis was made in the products control laboratory of the same mill. The results of the tests are shown in Figures 1 and 2.

A summary of the results appears in Table 3. The data reveal that the sequence bringing about the greatest reduction in fragment count for the least loss of wheat to offals is also the simplest sequence. In brief, it consists of one pass of the wheat through an Entoleter scourer-aspirator, equipped with a 14-in. peg rotor rotating at 3,500 r.p.m. The liner of the scourer is smooth.

The sequence providing the lowest fragment count, regardless of the loss of wheat to offals, involves three passes through the Entoleter, starting with a pass of the dry wheat through the 1,750 r.p.m. scourer-aspirator equipped with the 14 in. peg rotor and smooth liner. The second step is passing the wheat, after tempering, through the Entoleter scourer-aspirator equipped with a 14 in. peg rotor. This is followed by the pre-break with the final aspiration on the Kice aspirator.

The tests indicate that sequences 4, 5 and 6 are superior for reduction of fragment count with a minimum loss to offals. The small size of the lots and the fact that samples were not taken continuously during each run make it desirable to test these conclusions on a larger scale.

Table 3—Summary of Results in Study of Entoleter and Kice Aspirator for Removal of Infestation in Wheat

Sequence	Untreated wheat	One pass: Frag.*	One pass: Loss†	Two pass: Frag.*	Two pass: Loss†	Three pass: Frag.*	Three pass: Loss†	Final aspiration: Frag.*	Final aspiration: Loss†	Total Loss†
								Kice		
1	95	35	1.05	...	...	...	...	31	.34	1.39
2	95	48	.37	17	.66	...	...	23	.08	1.11
3	95	35	.32	26	1.41	...	...	16	.74	2.47
4	64	30	.07	22	.28	17	0.74	8	.49	1.58
5	95	29	.29	...	...	...	...	23	.05	0.34
								Entoleter disc rotor		
6	95	29	.29	...	...	...	...	30	.03	0.32
	Average	33	...	22	...	...	...	22	...	...

*Fragment count per 50 gm. sample of Buhler milled flour.
†Loss to offals expressed as pounds per bushel of wheat processed.

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A Report of the District 9, A O M Convention

Outstanding Program Presented at Annual Meeting Held in Portland

Members of District 9, Association of Operative Millers, who attended the organization's annual convention at Hotel Multnomah, Portland, Oregon, Oct. 18-20, found an outstanding program which included approximately 20 papers, reports and prize-winning essays selected by the program committee headed by George Walker, Crown Mills, Portland.

The program formally opened at 9 a.m. Oct. 19 with Willard H. Meinecke, General Mills, Inc., Tacoma, chairman of the district, presiding. Dorothy McCullough Lee, mayor of Portland, made an address of welcome.

The first paper, "Mill Management Speaks to the Operative Millers," by Moritz Milburn, president of Centennial Flouring Mills Co., Seattle, Wash., was read to the convention by Andrew M. Chrystall, manager of the Crown Mills, Portland.

Following a response by Mr. Meinecke, Harry E. Smith, Crown Mills, Portland, presented a paper, "Fellowship and Good Will." Mr. Smith's address was inspirational in type and was well received.

v v

Instrument Application in the Milling Industry

Fred R. Flory, instrumentation engineer, Industrial Instruments Division, Minneapolis-Honeywell Regulator Co., Portland, Oregon, presented the first technical paper of the meeting in his talk, "Instrumentation as Applied to the Milling Industry."

Mr. Flory discussed the many places that existing instrumentation can be applied to assist the miller in controlling the flow of temper water and other phases of mill operation. Mr. Flory stated that his company was expanding the application of instruments in the milling industry and hoped to be able to provide controls which would permit automatic disengagement of rolls in the case of choke-ups ahead of the roll or feed failure due to any cause.

v v

Duties Outlined for Maintenance Director

Elmer Holtz, plant engineer, Igleheart Brothers Division, General Foods Corp., Pendleton, Oregon, spelled out the fundamentals of a preventive maintenance program in his paper on that subject. He stated that a director of maintenance should be capable of organizing a maintenance department. At least a part of this organization should consist of separating the maintenance problem into elements, maintaining adequate records, planning for repairs with minimum down-time, and inspection of equipment for detection of potential repairs before they actually occur.

Mr. Holtz then proceeded to describe an interesting development in the installation and lubrication of anti-friction bearings. This new development provides for a bearing installed in the electric motor or bearing cartridge in such a way that grease introduced through the grease fitting or plug flows through the bearing into the relief chamber on the opposite side from where it can drain out through a properly located relief hole, preventing over-greasing of the bearing. He pointed out that most existing designs do not provide for the flow of grease through the bearing, or require expensive tear-down for adequate re-lubrication of so-called sealed bearings. He recommended that the millers watch for this feature when purchasing equipment supplied with anti-friction bearings.

v v

Chairman Reports on District Activities

Willard H. Meinecke, General Mills, Inc., Tacoma, Wash., chairman of District 9, reported on the activities of the organization in the chairman's address, "The Year in Review." He said that probably the most far-reaching achievement of the district during the past year was the formulation, by the executive committee, of the plan for training assistance in basic flour milling. This plan calls for assistance of District 9 AOM members who are interested in enrolling in the AOM Correspondence Course in Flour Milling. Not more than 10 millers each year, who wish to enroll in the course, will be aided by a fund of $600 established to defray the enrollment fees.

Other important achievements during the year, Mr. Meinecke reported, included a grant of $100 to Washington State College and a similar amount to Oregon State College for research work being done by the grain sanitation committee of the district. This group is headed by W. W. Liley, General Mills, Inc., Spokane.

The district again sponsored the crop improvement day and the "Bolters and Grinders" day as well as cooperated with the North Pacific Millers Assn. in its annual essay contest.

The executive committee also decided to expand the program of the annual meeting to provide for one and one half days of reports, technical papers and business sessions, instead of the usual one-day meeting, followed by a half day of tours, etc.

v v

Eber Reviews Progress of AOM During Past Year

The afternoon session Oct. 19, began with a brief report by Donald S. Eber, secretary, Association of Operative Millers, Kansas City, Mo., on the major achievements of the association during the past year. The outstanding achievement has been the service to the industry provided by the organization and its membership. Mr. Eber reported that mill management was extremely pleased with the progressive attitude and unselfish service provided by the association for the benefit of its membership and the interests of the industry.

He announced that the 1952 convention will be held May 19-22 at the Hotel Statler in Buffalo, N.Y.

The continuing membership drive under the chairmanship of J. George Kehr, vice president of AOM, will carry the membership total over the 2,300 mark in the very near future, according to Mr. Eber. The growth of the association makes it possible for it to offer its services without further increase in dues.

Mr. Eber closed with acknowledgement of the leaders in District 9, calling particular attention to George Walker, first chairman of District 9, and the many others who assisted in the formation of the district and who are responsible for its vigorous growth.

v v

The Use of Air in Flour Mills

For the benefit of those who were unable to attend the 1950 AOM convention, Dewey Robbins, superintendent, Fisher Flouring Mills Co., Seattle, reviewed his paper, "Some Basic Concepts in the Use of Air in Flour Mills." This paper was published in the AOM Bulletin last year and has proved to be one of the more popular papers published in recent years.

Mr. Robbins did a capable job of reviewing his paper. He succeeded in condensing into a very few minutes the highlights of this very interesting, but somewhat difficult, subject.

v v

Pillsbury Safety Plan Described for Millers

A very effective safety program for a modern milling organization was presented by Francis Weller, Superintendent, Pillsbury Mills, Inc., Astoria, Oregon. Mr. Weller recalled the history of the Pillsbury safety program which began in July, 1943, with a letter from the home office outlining the organization of the plant safety program.

This plan was highlighted by the appointment of a safety director who operates on a part-time basis, supplemented by a safety committee with a rotating membership designed to relieve supervision and other members from undue burdens due to long membership. The original program is now supplemented by a safety contest between plants which provides for a very attractive prize for each and every employee in the winning plants in each division. The effectiveness in this program was clearly demonstrated when Mr. Weller read off the number of plants showing no lost-time accidents during the present year under the spur of the safety program and the contest.

v v

Mill Control System Essay Contest Subject

Henry Nelson, Fisher Flouring Mills Co., Seattle, Wash., received the second prize award in the essay contest sponsored by the North Pacific Millers Assn. Mr. Nelson, in his paper, proposed a system of mill control and determination of mill yields by controlling the rate of flow of wheat to the first break and measurement of the rate of production of offals. In discussing yield as a measure of the miller's efficiency, Mr. Nelson pointed out that the accountant is interested in the amount of uncleaned wheat required to produce a unit of product while the miller is primarily interested in the amount of clean and tempered wheat provided at the first break roll as compared with the units of product produced. If it is not convenient for the miller to determine the total flour produced by the mill by use of dump scales or some other automatic weighing device, it is easier to check-weigh the feed streams since they constitute a smaller portion of the total mill flow. In converting these figures to yields and flour extraction, it is necessary to

Use of Fibrous Glass Wool to Prevent Insect Infestations in Railway Boxcars

By R. T. Cotton and A. C. Apt

Bureau of Entomology and Plant Quarantine

Agricultural Research Administration, U.S. Dept. of Agri.

INSECT infestation in railway boxcars is a serious problem to the shipper of flour and other food products. Waste grain, flour, meal and similar materials sift between the boards of the end and side linings and may accumulate in rather large quantities in the spaces between the linings and the frame of the car. Such accumulations harbor large insect populations during certain periods of the year, and shipments of flour or other susceptible food supplies in these cars may become heavily contaminated during transit, even in short hauls.

In 1940, Cotton, Wagner and Winburn* reported that bags of fresh flour placed in railway cars, some of which had been fumigated and cleaned by blowing with compressed air, were rapidly invaded by insects regardless of the treatment. Evidently the cleaning failed to reach infestations hidden behind the linings, and the fumigation was ineffective owing to the condition of the cars.

During the winter months, when railway cars are exposed to zero or near-zero temperatures, most of the insects behind the car linings are killed by the cold. Consequently, lit-

*Cotton, R. T., Wagner, George B., and Winburn, T. F. — Infestation in Transit; American Miller 68(4):38-40, 60, 62, 1940.

(Continued on page 17a)

the paper bag that held back a flood!

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take into consideration the moisture changes occurring between the tempered wheat as it goes on the roll and the moisture content of the feed and flour produced on the mill.

Although the miller is primarily interested in his yield as expressed by the amount of clean and tempered wheat required to produce a unit of product, he must still justify this figure with the accountant's figure of the amount of uncleaned wheat required to produce a unit product. These two figures vary considerably because of untempered wheat moisture and dockage or screenings removed in the cleaning system. Mr. Nelson presented examples to show the significance of normal variation in both dry wheat moisture and screenings removed in the cleaning flow.

v v

Growth of Feed Industry Outlined for Millers

Facts on the progress in nutrition and the increase in consumption of prepared animal feeds were presented by C. C. Lamb, director of feed formulas, Crown Mills, Portland, Oregon, in his paper entitled, "Development and Growth of Formula Feeds." The recent advances in animal nutrition can best be illustrated by the U.S. Department of Agriculture figures on broiler production in the U.S. In 1946 it required approximately 4 lb. feed for every pound of gain in broiler production. In 1951 it required only 2¾ lb. feed per pound of gain in broiler weight. Comparing a 1950 production of 600 million broilers per year as compared with a predicted production of one billion broilers by 1955, the recent strides in nutrition will save 1,130,000 tons of feed in this one item alone. A part of this tremendous gain has been accomplished through the use of antibiotics. The production of antibiotics alone amounts to $120 million annually and represents an entirely new industry with tremendous growth potential. In 1951 the production of animal feeds will amount to approximately 37 million tons. Mr. Lamb foresees a period of continued growth for the feed industry spurred on by further developments in the field of nutrition and animal feeding practices.

v v

Motors, "Air-Set" Rolls Described by A-C Men

The various types of motor enclosures and their proper application in industry was discussed by Gaylord R. Brooks, Pacific regional engineer, Allis-Chalmers Mfg. Co., San Francisco, Cal., in his paper entitled, "Motor Application in Flour Mills." This interesting and brief discussion was accompanied by slides illustrating each type of electric motor.

Mr. Brooks was followed by a surprise addition to the program in which H. K. Swan, director of the Grain and Chemical Milling Section of the Allis-Chalmers firm, presented the story on the "Air-Set" roll. Mr. Swan pointed out that there is now available to the flour milling industry a new design of roll stand which has been proven by several thousand hours of operating time in actual flour production. The outstanding feature of this new design is the application and control of roll pressure by means of an air cylinder. Additional features include vibratory feeders driven by variable speed compressed air motors, automatic feed detectors which automatically shut off the feed drive and disengage the rolls through the air-operated diaphragm should anything interfere with the feed to the roll stands. Mr. Swan reported enthusiastic acceptance of new design by some of the staunchest supporters of conventional roll stand designs.

v v

Importance of Sanitation Emphasized by Entomologist

Striking examples of the public concern with possible contamination of flour and flour products were provided by the citation of customer complaints by George B. Wagner, Director of the economic biology department, Pillsbury Mills, Inc., Minneapolis, Minn., in his paper entitled, "The Origin of Animal Contaminance Sometimes Found in Flour."

Although most of the cases cited were due to contamination of the flour after it left control of the miller, nevertheless, the miller was held responsible in the mind of the customer for the contamination which was alleged to have occurred. More and more bakeries are making and requiring contaminant analysis of flour as a part of their purchasing specifications. Mr. Wagner pointed out that there is only one way to convince management of the necessity for improved sanitation and that is by action resulting from Food and Drug Administration inspections, customer complaints, or by a presentation of the possible savings that can be achieved by eliminating all the possible sources of contamination. He then went on to point out that under the law it is the operative miller

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who is responsible for contamination occurring in the mill and that all possible precautions must be taken in order to effectively prevent any possibility of such contamination. Mr. Wagner pointed out that external infestation removed in the cleaning flow is not necessarily killed by the grinding of the screenings in the hammermill. These ground screenings carrying external infestation should by all means be kept out of the mill proper and away from flour.

He pointed out that moving stock does not provide a harborage for insect development. On the other hand, all areas where stock can settle and remain at rest provide a potential source of infestation and subsequent contamination of the mill products. Mr. Wagner closed by commenting on the fact that the Millers National Federation has invited other industries having the same insect control problem, to join with the federation in its study of the problem of preventing contamination to these food products.

v v

Progress Being Made in Wheat Quality Program

Robert O. Fletcher, executive secretary, Pacific Northwest Crop Improvement Assn., Walla Walla, Wash., reported on the progress being made in the Pacific Northwest area in the improvement of wheat quality. A regional committee consisting of representatives of Fish and Wildlife Service, U.S. Department of Agriculture and local colleges and experiment stations as well as representatives of producers associations was formed to study the problem of contamination of wheat.

A survey of contamination in wheat delivered to mills in the Pacific Northwest has just been completed which reveals that a great deal more contamination by insects as well as rodents and birds is occurring and had been previously supposed.

Progress is being made with this report and it is ammunition in stirring interest in action by the railroads, country grain dealers and others who control the quality of the wheat in commerce.

In regard to the development of disease resistance and of milling quality in wheat varieties being produced in the Northwest, Mr. Fletcher pointed out that in recent years there has been a 50% reduction in federal research relating to wheat production due to the diversion of funds to so-called action programs within the U.S. Department of Agriculture. Action is now being taken by interested organizations in encouraging the necessary appropriations to speed up variety development work.

Mr. Fletcher called attention to the introduction of a variety known as Henry. This is a variety of hard red spring wheat originally developed in Wisconsin for its high yielding qualities. It is being introduced in the Northwest to provide the spring planting in case of winter wheat failures. It has low protein and its quality from a milling and baking standpoint is somewhat doubtful. If funds can be obtained a plot test will be made of Henry at the Lind Experiment Station where approximately 60 acres will be planted in order to provide full-scale milling test in this variety.

v v

New Officers Chosen at Business Session

John Egli, Preston-Shaffer Milling Co., Waitsburg, Wash., was elected chairman of District 9 at the organization's business session Oct. 19. He succeeds Willard Meinecke. Homer Mesler, Baker (Oregon) Mill & Grain Co., was elected vice chairman succeeding Mr. Egli and Francis King, Wallace & Tiernan Co., Inc., Seattle, was reelected secretary-treasurer.

W. W. Liley, General Mills, Inc., Spokane, was elected to the district's executive committee and Mr. Meinecke was named to the national executive committee.

Other business included approval, by the members, of the executive committee's training assistance plan. (This plan is described in a report of Mr. Meinecke's address.)

AOM President Reports on Association Affairs

Charles R. Veeck, Eagle Roller Mill Co., New Ulm, Minn., president of the Association of Operative Millers, told the members of District 9 that the emphasis on the association's program is placed on service to its members and to the milling industry.

He said that one of the prime functions of the organization is the collection and dissemination of knowledge. With the formation of the sanitation committee, headed by George B. Wagner of Pillsbury Mills, Inc., Minneapolis, and the continuing efforts of the education committee, it is hoped that further progress will be made in achieving this goal, he said.

Mr. Veeck commented briefly on the activities of the sanitation committee and the education committee. The latter group, he reported, is making progress in assembling material for a handbook for cereal processors. Prof. E. P. Farrell of Kansas State College, Manhattan, is chairman of the education committee.

The research committee, under the direction of Prof. John M. MacKenzie, is proceeding with a study of more effective means of grain cleaning for the purpose of removing contamination.

• A RECORD OF ACHIEVEMENT •

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1809—1882

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Tri-Section Chemists' Meeting Features Seminar on Amylases

MANHATTAN, KANSAS — The new development in the commercial use of fungal amylases in bread baking furnished the theme for the annual tri-section meeting of the American Association of Cereal Chemists, held at Kansas State College Oct. 12-13. The meeting was formally opened with a banquet held the evening of Oct. 12 in Thompson Hall at the college.

George Garnatz of the Kroger Food Foundation, Cincinnati, discussed the challenge presented to cereal chemists by flour specifications for white pan bread. Mr. Garnatz pointed out the need for uniformity for flour specifications as is demanded by the baking industry and as determined and expressed by the cereal chemists.

Clarification of flour specifications for white pan bread is necessary, Mr. Garnatz declared, in order that the buyer and the seller may get together on common ground.

Questions Ash Test Value

In general, Mr. Garnatz pointed out the great need and desirability of the results of one laboratory checking closely with those in another on the same sample. The ash content of flour, he said, is used by the trade as a grade control factor. He felt that it would be desirable to develop some other test that would indicate grade more closely, since flours milled from high-ash wheats are penalized by the ash test.

Approximately 125 members attended the symposium on enzymes which was held in Willard Hall on the college campus Oct. 13. Uses of enzymes in bread making was the topic for the morning discussion.

Dr. Paul Boyer, division of agricultural biochemistry, University of Minnesota, started the program with a talk on the nature of enzymes and enzyme action. Dr. Boyer stated that the attainment of a reaction equilibrium is increased by the use of enzymes as organic catalysts, but the position of the equilibrium is unchanged. He said that enzymes show specificity and may be classified as absolute, relative and sterochemical. Enzyme inactivation may result from denaturization by heat of 100° C., alkali, acids or ethanol.

Dr. Gerald Reed, Special Products Department, Rohm & Haas Co., Philadelphia, described the manufacture of industrial enzymes for use in bread making. Dr. Reed reviewed the process of making mold bran and showed a flow sheet for semi-commercial mold bran production. Diastase and protease, he said, are the most important enzymes now manufactured commercially. He concluded by stating that good commercial baking enzymes, under correct conditions should not lose more than 2 to 3% of their activity a month.

The effect of alpha-amylase on baking properties was the subject of a talk by Dr. R. M. Sandstedt, department of agricultural chemistry, University of Nebraska. Dr. Sandstedt discussed how amyladextrin, formed as a result of damaged starch granules and appears in solution as a layer of gelatinous material above the layer of pure starch. Alpha-amylase, when added to the starch swiftly reacts with the damaged starch granules and leaves the undamaged granules unaffected. The extent of this effect varies with different flours mainly because of the reaction of different wheats to the milling processes.

Prof. John A. Johnson, host of the meeting and member of the department of milling industry staff at Kansas State College, discussed amylases and proteases in baking. In his experience, Prof. Johnson said, it is apparent that the most important role of alpha-amylase is in the baking rather than the fermentation process. It is his belief that it should

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be recognized that both alpha-amylase and proteinase are important in the proper supplement of flour, the amylase influence being most important in the baking stage while the proteinase is active during the fermentation and dough make-up operation.

Dr. Oscar Skovholt, Quality Bakers of America, Inc., New York, concluded the morning program by discussing the usefulness of fungal enzymes in bread production. Since experimentation on fungal enzymes by the Quality Bakers of America has been active only two years, nothing conclusive has been recorded as yet. Dr. Skovholt believes that the final answer of whether to use fungal amylase in dough is in shop experience.

At the luncheon in Thompson Hall, Dr. H. K. Parker, Wallace & Tiernan Co., Inc., Newark, N. J., president of the association, reviewed the problems that come before the AACC. He said that steps are being taken to solve the problems arising in the pre-mix field.

The final speaker of the meeting was Dr. A. K. Balls, department of enzyme chemistry, University of Purdue, who reviewed the problems of food preservation resulting in the degradating effects of enzymes. Dr. Balls stated that, normally, the most effective means of preserving food is by heating the food to destroy the enzymes. These heating processes are blanching, sterilization, pasteurization and steeping. He also reviewed the importance of temperature on enzyme reactions in bread production.

——BREAD IS THE STAFF OF LIFE——

BEMIS PUBLICATION CITED

ST. LOUIS—Bemistory, the employee magazine of the Bemis Bro. Bag Co., general offices in St. Louis, has received one of three awards of excellence in the magazine division of the annual competition of the Society of Associated Industrial Editors.

How to Increase Hoisting Speeds of Fork Trucks

Hoisting speeds of fork trucks are a critical consideration in plants, warehouses and shipping departments where large volumes of pallet-loaded materials must be moved quickly each day. Any method for saving time by speeding fork-truck operations natuarlly results in appreciable yearly cost savings. Often overlooked is the fact that similar fork trucks can have different hoisting speeds.

The critical considerations here are not so much the weight and operational capacities of the truck, but rather the rated voltage of the power source. Because the lifting speeds of battery-powered fork trucks are almost directly proportional to the impressed voltage for a given load, higher voltages will provide faster lifting speeds. Hoisting-speed increases of 15 to 20% by this method are not uncommon.

Therefore, when considering the purchase of new equipment or the possibility of increasing the capacity of existing equipment, it is advisable to investigate the economics of a higher-voltage power source.

This does not imply that it is always more economical to operate fork-truck lifts at the highest possible speeds. There are many installations where the capacities of existing equipment are equal to and even greater than the plant's most critical material-handling needs.

However, in plants, warehouses and shipping departments where fork trucks are in almost constant use, any gain in time or speed will allow the same number of trucks to do considerably more work. For an example of how a larger power source can increase fork-truck hoisting speeds, let us look at the speeds of a 5,000-lb. truck under two voltage conditions.

When powered by a 30-volt industrial battery, this truck has average hoisting speeds of 29 f.p.m. (feet per minute) with empty forks and 14 f.p.m. when loaded to capacity. However, when powered by a 36-volt power source, the same truck can lift its unloaded forks at a speed of 34 f.p.m. and capacity loads at 18 f.p.m. This represents a hoisting-speed gain of approximately 17%.

Similar possibilities exist for larger and smaller industrial trucks. Speeds for telescopic trucks in the second stage of hoisting are slightly less than for the single-stage hoist trucks. This is because of the greater weight and the additional friction.

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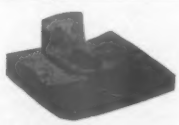

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Developments in Pneumatics

By Fritz Scheiss
Buhler Bros., Inc.

TRANSPORTING materials in pneumatic systems is far from being a new idea. It has been successfully applied to many industries where fewer vertical liftings were required. Also, it has been applied to the conveying of grain and other granular materials, to high speed grinders and other operations, for many years. The reason that we can now apply the pneumatic conveying system with success in flour mills is the knowledge gained in research in aerodynamics.

The benefits of this research have been (1) improvement of the cyclone collector to a point where extremely high efficiencies may be obtained with the result that practically dust-free air may be sent on to the filters.

(2) The smallness of the cyclones makes it possible to place them neatly and compactly.

(3) A greater knowledge is now available regarding design of the pneumatic conveying pipes. In particular, it is realized that the diameter of the pipe should be relatively small.

(4) The high pressure used and the high velocity of the air within the tubes.

The different kinds of stocks transported in a flour mill had to be examined in the air stream until the correct mixing proportions and velocities were determined for each of the stocks. The question was also asked as to how the different particles are changed during the conveying process; that is, it was necessary to determine whether there was any abrasive action, which would be undesirable especially in mills producing durum semolinas.

Another impulse which gave the pnuematic transport system considerable attention was the fact that many countries had mills which were destroyed or obsolete. New mills therefore had to be rebuilt and the old ones had to be renewed to an up-to-date standard. But the building costs were high and the building materials scarce. Also the question of time had to be considered. The installations had to be rebuilt as soon as possible and the requirements of the millers to install their plants as economically as possible had to be taken into consideration. All the advantages of the pneumatic system came into full realization at this time. No more elevators with all the known disadvantages of choking, troubles from slacked elevator belts, no more special supervision of the bearings, no danger of fire, less spoutings, less suction pipes, better sifting effect through cooler stocks, and less dust collecting flour.

With better sifting and with less filter flour, the milling results were excellent. There came the simple convenient arrangement, great freedom of choice of layout, possibility of arranging the pipes between the windows and therefore, giving a brightness to the rooms, more space, a minimum of cleaning requirement, and especially, the breeding of insects was reduced to a minimum.

In the construction of new plants, we are turning toward new ways. Instead of the five, six- and seven-floor buildings, we now have the two-, three- and four-floor mills.

Taking into consideration the different new construction in the past few years, it can be said about 30% of building space has been saved. This was accompanied by saving of erection material and spoutings, and also in a great reduction of erection time. If we consider that the erection costs (working costs) make about 15% to 20% of the installation value, it is understandable that the reduction of the erection time, about 30%, makes an enormous difference in an itemized budget. The reduction of the erection time is naturally not

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only due to the pneumatic conveying installation but also to the prefabricated metal spoutings. We know that metal spoutings were also used in the elevator mills, but the danger of condensation was present everywhere, and due to this factor, the air temperature in the mills had to be kept high. With the pneumatic conveying today, the air in the mill is fresh and we no longer have this overheated and stale air, which is beneficial for breeding and multiplication of the insects. Also taking into consideration that in all the conveying elements the air moves with a high speed, and no insect can live in such a place, it is clear that the new mills today have minimized the infestation to its lowest point.

Now the skeptical man will ponder different questions. For example, what is the needed power, how high is the moisture loss, can we use the pneumatic in the durum mills, etc. Naturally, the power in the first installations was higher, but with the time, and with all the experience, we can state today that the total power for a pneumatic mill is not much over the needed power for an elevator mill. The power consumption of a pneumatic installation is determined, first, from the flow sheet, and, second, from the building. It is not enough to give the power per grinding unit of raw materials and then form an opinion from this.

Flow Sheet Influence

If we have a short or a longer flow sheet, the liftings will respectively be more or less. For example, a mill with the same capacity can have 20 or 25 liftings, and it is clear that the mill with 25 liftings will consume more power than the mill with 20 liftings.

Building Influence

The height of a building plays a big role in determining the power consumption. That is, with the same capacity and the same number of liftings the power which an 80 ft. mill needs will be much greater than for a mill which is only 60 ft. high. Therefore, the figures per grinding quantity would be misdirected if a comparison were made. For example, the actual power requirement of some newly installed mills show the following figures: A mill with capacity of 2,400 sacks and 40 liftings, and a height of 60 ft. consumes .028 H.P. per sack. Another mill with a capacity of 1,900 sacks but with 50 liftings and with the same height, 60 ft. consumes .034 H.P. per sack. A third mill with the capacity of 1,600 sacks but with only 28 liftings and with a height of 75 ft. had a power consumption of .022 H.P. per sack.

These figures show you how the three factors, capacity, number of the liftings, and conveying height, influences the power consumption.

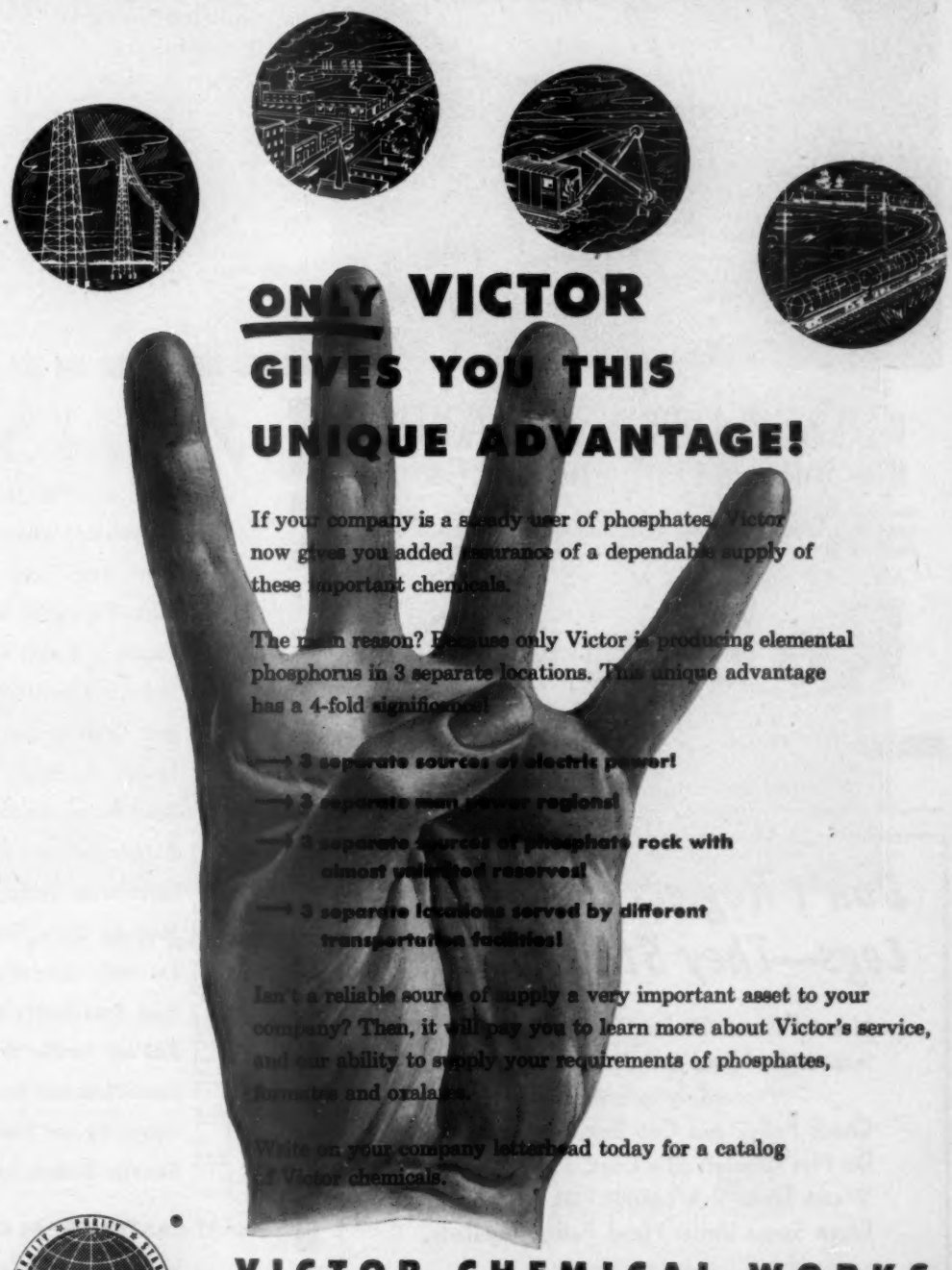
Less Moisture Loss

And now to the question of the moisture loss. When analyzing the different sources where moisture losses occurred, it was found that two fifths of the total loss is attributed to a heat rise in the product through grinding, two-fifths to the effect of cooling during transport, and one-fifth to the purifying system. The total evaporation loss increases with higher moisture content if, at the same time, the heat development through grinding rises. If evaporation loss is high the cause will be too high temperature in the product, or wrong calculation in the air quantity.

In order to keep these evaporative losses down, it is essential to avoid excess heating of the product and to have the right quantities of air. Both problems find their solution in the pneumatic conveying system, but it is also absolutely necessary to have a correct calculation of the quantity of air needed to convey each individual stock.

As a result of air investigation covering more than 200 pneumatic milling plants in all parts of the world, the evaporative loss was 0.5% to 0.8% under the loss of a normal elevator mill in the same place, every time. All the questions which a skeptical man could ponder were desolved after a six-year practice in the mills with all capacities and working in all possible climates. The question as to whether we can use the pneumatic system for delicate products such as semolina was also desolved in the practice. Many durum mills are running, the results are excellent and the quality as the granulation of the semolina is without objection. We have gone as far as to use the pneumatic system in the food industry also. For example, mills are running a long time now, especially for these products. The pneumatic conveying also proves to be particularly favorable to the severe demands in respect to cleanliness, perfection of flavor in the products and hygienic working conditions. Therefore, we automatically can answer to the question of whether we have a changing in the flavor of the products in pneumatic mills as definitely no.

The pneumatic conveying also found its way into the cleaning house. The problem here was more difficult. As was mentioned previously, the air was used as a conveying means and especially in the wheat loading and unloading installations, but the power consumption was so high that it would not be economical to make the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installation on the same basis. We had to find another way to reduce the total power consumption. We arrived at this solution with the construction of the double separator or double cyclone. This double separator not only allows the separation of the wheat from the air but also the separation of the lighter mixtures from the wheat. The air then carries the dust which is separated in a normal cyclone or filter. This means that in a new cleaning house we have no further use for a suction system. The air quantity with which we are working in the cleaning houses today is about the one fifth of the air quantity which we needed in a normal cleaning house with elevator and a complicated suction system. Therefore, the higher power consumption for a pneumatic conveying system is balanced through the abolition of the big fans and cyclones for the suction system. The tremendous cyclone assemblies are replaced through one or two small cyclones or one dust collector.

Results "Surprising" in English Research of Bran Thickness

Two workers at the Research Association of British Flour Millers, St. Albans, England, recently engaged in a study of the thickness of wheat bran and obtained data that "may appear surprising in two respects," it is stated in a report of the research, published in a current issue of Cereal Chemistry.

The two respects in which the data may "appear surprising," according to the workers, Joan Crewe and C. R. Jones, are:

1. All types of wheat examined have brans of similar thickness. This finding, it was pointed out, "opposes a strong practical belief, and it must be admitted that visual and tactual experience in milling suggests that some wheats are thicker skinned than others."

2. The difference in bran thickness between large and small grains of any one type is slight.

In the research, the mean thickness of bran of several varieties of English and Canadian wheats at ordinary moisture contents (13-18%) was found to be 67 microns, "regardless of the type of wheat." In wet-mounted sections, the mean total bran thickness was found to be in the range of 100 to 109 microns.

In offering an explanation for the conclusion that "all types of wheat examined have brans of similar

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1. WORKING CIRCULATION —Studies of flour manufacture show that 1,100 of the flour mills in this country produce 98% of the flour. Milling Production with its controlled circulation reaches the key men in these 1,100 flour mills. This working circulation provides contact each month with the people who directly or indirectly control the buying — superintendents, operative millers, chemists and plant managers. *There is no waste circulation—only working circulation*—and you are assured of reaching your potential customers in the most productive mills.

2. LEADERSHIP MAKES READERSHIP — Readership surveys and unsolicited correspondence from its readers attest to the editorial leadership of Milling Production. That editorial leadership is held by complete words-and-pictures reports of the latest milling technology, current news, features and complete coverage of the activities of the industry's two technical associations. *The real price the reader of a publication pays is the amount of time he puts in reading that journal.* Over one half of the readers of Milling Production have requested that it be sent to their homes so that they may enjoy uninterrupted reading pleasure.

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MILLING PRODUCTION

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thickness," the English scientists stated:

"(A) Wheats considered thick-skinned are those whose endosperm can be less readily separated from the bran, which usually carries adherent endosperm when handled.

"(B) In some wheats, the epidermis tends to separate partially from the inner layers of the bran, causing air spaces to be included within the apparent thickness of the bran. Superficially such bran is thicker, to an irregular extent, than those where no separation occurs, but of course it is not so in respect of total thickness of actual tissue."

Use of Glass Wool

(Continued from page 3a)

tle trouble is experienced from insects in railway shipments during the winter and spring months. However, when used to carry grain in the early summer months the cars quickly become infested. It has been estimated that a carload of infested grain may contain a million or more insects. These insects become very active when disturbed, and when grain is loaded in the cars they crawl around and find their way to the accumulations behind the linings.

Recent experiments by Cotton, Frankenfeld and Redlinger† indicated that treatment of the cars with residual sprays containing lindane, DDT, chlordane, the pyrethrum- piperonyl butoxide mixture, or combinations of several of them gives considerable relief from insect infestation. The relief is only temporary, however, and control measures, to be effective, must be continually employed.

†Cotton, R. T., Frankenfeld, J. C., and Redlinger, L. M.—The Treatment of Railway Boxcars With Insecticidal Sprays—A Preliminary Test; Milling Production 15(3): 1, 30, 1950.

Changes in the construction of railway boxcars to eliminate trouble spots or to facilitate cleaning and the removal of accumulations have been advocated for many years, but little progress has been made.

One improvement has been the removal of the bottom board of the side linings so that accumulations behind them can be readily cleaned out or will shake out with the movement of the cars. This type of construction is not feasible at the ends of the cars, as it would serve no purpose, as accumulations would be prevented from draining into it due to the design and construction of the car end.

A new idea for preventing the accumulation of waste material behind the linings at the ends of railway boxcars was recently advanced by a Minneapolis engineer, Frank S. Bishop. It calls for the filling of the irregular and end-wall spaces with fibrous glass wool. This material, which is of pure glass fibers, will not rot and is highly resilient. It is easily compressed, and under vibration, such as may occur by the jolting of a car in transit, will expand or fluff out and tend to fill all voids.

In practice the interior surfaces of the corrugated steel end walls of the cars are coated with an asphalt emulsion applied by brush or spray. Strips of fibrous glass wool two inches thick and 24 inches wide are installed horizontally. The wooden end liner compresses the wool blanket as it is nailed into position in the conventional manner. The cost of these glass blankets plus labor of installation is approximately $23 per car.

The first car to be prepared in this manner was treated in June, 1947 and has been in commercial operation ever since. In June, 1951, the junior author had an opportunity to examine this car and a similar car that had been treated in October, 1950.

In the car that had been on the road for four years the fibrous glass wool blankets had been installed in two different ways. At one end the material was applied in vertical strips over the nailing strips. At the other end the material was applied in horizontal strips with the nailing strips forced into position over the fibrous glass. The last load carried by the car was charcoal and as a result the interior was blackened with charcoal dust. When the end lining boards were removed, the fibrous wool blanket was found to be still in good condition.

No accumulations of grain or milled products were found behind the end linings. However, screenings had spilled from the side lining at the end where they had accumulated in spite of the self-cleaning feature of the side linings. Two dead insects were found in these screenings. Evidently it would be advantageous to

JONES-HETTELSATER CONSTRUCTION CO
Designers and Builders for Milling Companies
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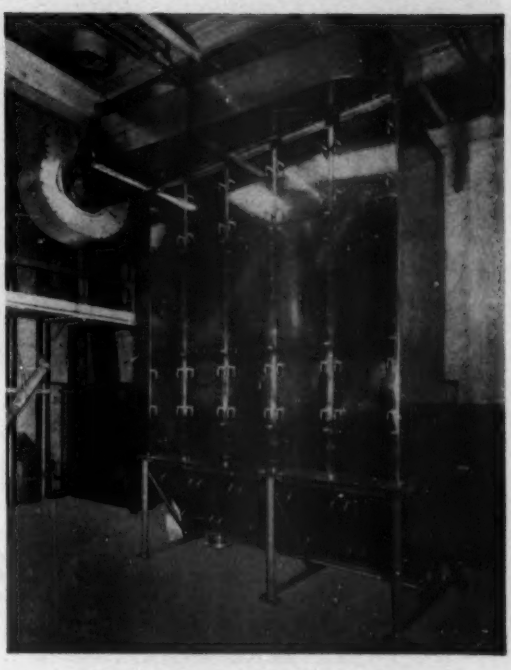
$ave $ out of DU$T

Your mill benefits from the most improved dust control equipment when you have the Simon Suction Filter Dust Collector.

Dust laden air that escapes to the atmosphere is both a nuisance and a waste of valuable stock. This mill problem is effectively solved with the Simon Suction Filter Dust Collector. Self-contained, all-metal, this unit needs no accessory equipment except a fan and connecting ducts. Dust is collected at practically 100% efficiency, permitting air to be blown out of the flour mill without costly loss of stock, or into the building without risk of dusty atmosphere.

ADDED ADVANTAGES: Cleaned air from collector can be returned to mill to save heat in winter, and blown outside in summer to control humidity • Stops the dust nuisance • Proven by years of experience throughout the world • Streamlined ALL METAL design with minimum ledges and dead spots • Minimum maintenance cost • Low power — 1-HP to operate 12-section unit • Operates under suction, eliminating dust leaks.



The Simon Suction Filter Dust Collector
U. S. Design and Manufacture by
ENTOLETER DIVISION

Write to us for complete information on "ENTOLETER" Centrifugal Machines and the Simon Suction Filter Dust Collector. We will be glad to make recommendations to meet sanitation and dust control problems encountered in mill operation. ENTOLETER DIVISION, The Safety Car Heating and Lighting Co., Inc., 1189 Dixwell Avenue, New Haven 4, Connecticut.

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Centrifugal Machines include:

- **"ENTOLETER" Insect Destroyers**
- **"ENTOLETER" Scourer Aspirators**
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CENTRIFUGAL MACHINES

CONTINUOUS INSECT CONTROL SYSTEM

install the glass wool blankets behind the side lining as well as at the ends.

The second car examined had been prepared in the conventional manner with the strips of fibrous glass wool installed horizontally. When the end linings were taken off to expose the glass wool, the resiliency of the material under compression was well demonstrated by the small vertical fins that appeared on the surface of the padding. These fins were formed by the action of the glass wool forcing its way into the fine cracks between the tongue-and-groove boards of the end lining. There was no accumulation of waste grain between the end and side linings, because the glass wool had expanded to fill the voids normally found at this junction. The material was still clean, with no evidence of deterioration.

Patches of the material were removed from various sections of the end liner to determine whether accumulations of dust had seeped behind the filler. No waste grain, feed, dust, or insects were found behind the end linings.

It is reported that at least nine railroad companies have one or more cars treated by this method. The performance of these cars during the next few years should afford an excellent demonstration of the worth of the treatment.

Some insects fly into loaded cars in numbers at times during the summer, and certain of them may find shelter in cracks in the woodwork. Therefore, it would be impossible to eliminate all insects from the cars. However, the number of such insects is insignificant compared with the number that are harbored normally in accumulations behind car linings. The elimination of insects behind car linings should be an important step toward solving the problem of infestation in transit.

Good white bread made better...

THERE'S GOOD REASON why the Tenth Anniversary of bread and flour enrichment is being celebrated this year . . . because you have made good white flour and popular white bread better by enriching . . . and because this has meant a major contribution to the public's good health.

Be proud that you serve so well. By keeping faith with nature you make good foods better!

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GREATEST Design Advancement in Years!

HERE'S THE MACHINE that literally "stole the show" at this year's AOM convention in Chicago. It's the completely modern *AirSet* Roller Mill—designed, built and introduced by Allis-Chalmers.

While using the same basic elements as other roller mills, the *AirSet* mill has distinctly new control features incorporated in its design.

Grinding rolls cannot run together when stock flow is interrupted . . . because—electrically operated gates in spout inlets *close* when feed stops. Electrical interlocking of gates, feeders and rolls results in immediate stopping of feeders and opening of rolls — thus safeguarding grinding surfaces. When flow of stock resumes, automatic controls bring rolls back to correct position and once again place machine in operation.

Guesswork on roll settings is eliminated . . . *because* — rolls can be set absolutely parallel with each other and you get the *same* air pressure on each end.

Uniform feeding of stock is assured . . . because — a high speed vibrating type feeder is used along with an *air motor* for easy, flexible feeder-speed control.

Other advantages include: Battery operation of rolls — eliminating costly and unsightly lineshaft equipment . . . Positive roll pressure — because you grind against *air* instead of springs . . . Roll settings that hold indefinitely — eliminating need for frequent correction . . . Choice of roller bearings or split, easy-to-remove sleeve bearings for roll mounting.

Flour mill men have called this mill the closest approach to completely automatic milling yet devised — and the *greatest design advancement in years!*

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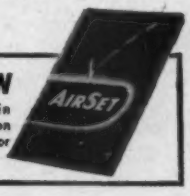
New illustrated bulletin 0687670 contains information on the *AirSet* mill. Write for your copy of this book.



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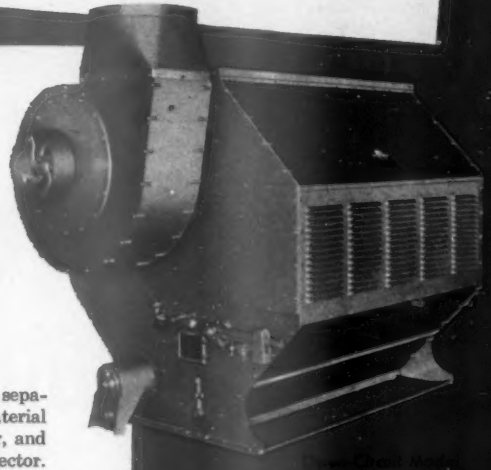

Open-Circuit Model

YOUR CHOICE OF OPEN-CIRCUIT OR CLOSED-CIRCUIT MODELS

The Carter *Duo-Aspirator* recently has been redesigned and new features have been added. Now it is available in (1) its previous closed-circuit construction and in (2) open circuit, for either belt drive or direct motor drive.

The closed-circuit model provides two separations: the grain or heavier material is aspirated, and the lighter material removed. The open-circuit model provides three-way separation: the grain or other material is aspirated, the heavier material removed by aspiration is discharged from the settling chamber, and dust and other light material are exhausted from the fan to a collector.

Outstanding among the several new features are the drop-bottom clean-out beneath the conveyor in the settling chamber, and a self-cleaning suction tube leading to the fan . . . which combine to prevent any accumulation of material within the machine.

Other important features are retained—all-metal construction . . . ball-bearings throughout . . . compactness . . . low power requirement.

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A new folder illustrating and describing the improved, redesigned Carter *Duo-Aspirator* has just been prepared. Write for your free copy today

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